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## A NEW PASTE FOR FROSTING GLASS

**O. N. Sidel'nikova,<sup>1</sup> A. A. Sidel'nikov,<sup>1</sup> and D. V. Svistunov<sup>1</sup>**Translated from *Steklo i Keramika*, No. 4, pp. 30 – 31, April, 2006.

A fluorine-free paste for glass frosting and decorating has been developed. Examples of its application are described.

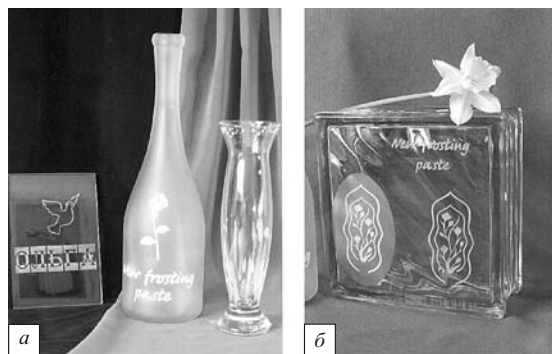
Among common methods used to decorate glass surfaces are sand blasting or chemical frosting using solutions containing hydrofluoric acid or its compounds. In both cases the surface glass layer is removed nonuniformly, which creates a rough surface. It should be noted that sand blasting creates a rougher surface relief, since glass particles are knocked out in more stringent conditions than in chemical frosting.

In the present paper we report on a new paste for glass frosting that is free from hydrofluoric acid or its derivatives. Figure 1 shows some samples of glass with patterns produced using the new paste. The frosting process in this case proceeds at a temperature around 300°C and consists in modifying a subsurface glass that later develops a structure (Fig. 2) with a certain number of microcracks that modify the optical properties of the frosted surface area, which acquires a milky-white color. At the same time, the glass surface remains smooth to the touch.

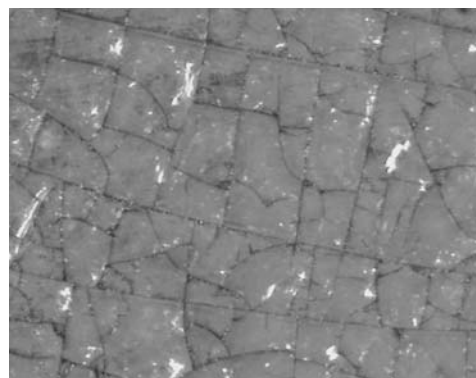
The new paste can be used to decorate glass either on its own, or in combination with mixtures traditionally used for chemical frosting. In the second case it is possible to obtain two different shades of glass frosting: semitransparent frosting by the usual chemical frosting method and milky-white frosting using the new paste. A combination of these two shades substantially expands the opportunities of an artist or designer in creating new patterns.

The frosting technique using the new paste has the following stages:

- rinsing and degreasing glass;
- applying a paste layer using a doctor blade, a brush, or another tool, including a stencil or a silk screen;
- removing the stencil, if it has been used at the preceding stage;
- heat treatment of the glass with the deposited paste layer for 15 – 20 min at a temperature around 300°C;
- removing the dry paste residue by rinsing in water.



**Fig. 1.** Samples of glass with patterns applied using the new frosting paste: *a*) flat glass, a bottle, a vase; *b*) a glass block.



**Fig. 2.** Microphoto of a frosted surface fragment with cracks (× 100).

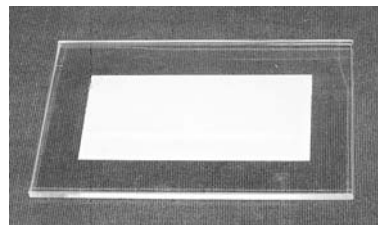


**Fig. 3.** Samples of glass (flat glass, a vase) with frosted patterns produced by handpainting.



**Fig. 4.** A sample with a frosted pattern applied to a mirror using the new frosting paste (size 20 × 30 cm).

In contrast to the traditional frosting, in applying the new paste layer one can correct the pattern without modifying the glass surface, since the frosting stage takes place under heat



**Fig. 5.** A flat glass sample with a uniform frosting area (size 10 × 15 cm).

treatment. The intensity of the milky-white color of a frosted area depends on the paste layer thickness, which offers additional options to the artist or designer in creating a pattern, for instance, in handpainting using a brush (Fig. 3). The consumption of the paste is 0.01 – 0.02 g/cm<sup>2</sup>.

It should be noted that the new frosting paste can be used to produce a pattern on a mirror. The light transmission through the frosted area together with the reflection from the metallic mirror layer impart additional brightness to the frosted pattern. Figure 4 shows a sample of a mirror with a frosted pattern deposited on its surface.

The new paste can be used to frost the entire glass surface (Fig. 5). In this case it is essential to have a paste layer with a uniform thickness. Such frosted glass can serve as a substrate for subsequent application of various organic or inorganic mixtures that modify glass surface properties.

*The copyright to the new paste formula for glass frosting is protected by RF patent No. 2238919.*